

CLAIMS

I claim

- [C01] 1. A reciprocating pump dump valve utilized in hydrocarbon service for controlling the flow of produced fluid comprising:
- a hollow piston having an upper end, a lower end, an inside and an outside;
 - a barrel having a top, a bottom, an interior and an exterior and adapted to slidably receive said piston about said outside thereof;
 - a head having a bottom-side threadably secured at said bottom-side thereof to said upper end of said piston;
 - a dump port situated approximately midway between said top and said bottom of said piston wherein said dump port provides communication between said inside and said outside of said piston; and,
 - means for slidably retaining said piston within said barrel;
- wherein said piston is capable of limited upward and limited downward movement within said barrel such that when said piston is fully upward said dump port is in further communication with said exterior of said barrel placing the dump valve in a dumping position thereby allowing flow of produced fluid from said inside of said piston to said exterior of said barrel and such that when said piston is fully downward said dump port is not in communication with said exterior of said barrel placing the dump valve in a closed position thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel.
- [C02] 2. The dump valve of claim 1 wherein said piston has a circumference and wherein said means for slidably retaining said piston within said barrel further comprises:
- a piston ring formed about said circumference of said lower end of said piston extending radially away from said piston; and
 - a barrel lip formed within said interior of said barrel approximately midway between said top and said bottom thereof;

wherein said piston ring comes to rest against said barrel lip when said piston is fully upward thereby inhibiting further upward movement thereof and wherein said bottom side of said cylindrical head comes to rest against said top of said barrel when said piston is fully downward thereby inhibiting further downward movement thereof.

[C03] 3. The dump valve of claim 1 wherein said piston has a circumference and wherein said means for slidably retaining said piston within said barrel further comprises:
a piston ring formed about said circumference of said lower end of said piston extending radially away from said piston; and
a barrel lip formed within said interior of said barrel approximately midway between said top and said bottom thereof;
a safety ring having an interior, an exterior, a top and a bottom adapted to be slidably received by said piston;
a safety shear pin;
a safety ring safety shear pin aperture radially formed midway between said top and said bottom of said safety ring adapted to receive said safety shear pin and extending from said exterior of said safety ring to said interior of said safety ring; and,
a piston safety shear pin aperture radially formed between said upper end and said lower end of said piston also adapted to receive said safety shear pin and extending from said outside of said piston to said inside of said piston;
such that when said safety shear pin is inserted into said safety ring safety shear pin aperture said safety shear pin passes into said piston safety shear pin aperture thereby locking said safety ring to said piston such that when said piston moves upward within said barrel said safety ring contacts said barrel lip thereby preventing full upward movement of said piston preventing further communication of said dump port with said exterior of said barrel thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel; and

such that when said safety shear pin is sheared said safety ring slides along said piston towards said piston ring thereby allowing further upward movement of said piston and allowing further communication between said dump port and said exterior of said barrel placing the dump valve in said dumping position thereby allowing flow of produced fluid from said inside of said piston to said exterior of said barrel; and such that when said piston is fully upward said safety ring comes to rest between said piston ring and said barrel lip thereby inhibiting further upward movement of said piston and wherein said bottom side of said cylindrical head comes to rest against said top of said barrel when said piston is fully downward thereby inhibiting further downward movement of said piston.

[C04] 4. The dump valve of claim 1 wherein said piston ring has a midpoint and an outside and further comprising:
an entry shear pin;
a piston entry shear pin aperture radially formed at said midpoint of said piston ring adapted to receive said entry shear pin and extending from said inside of said piston to said outside of said piston ring; and,
a barrel entry shear pin aperture radially formed near said bottom of said barrel also adapted to receive said entry shear pin and extending from said interior of said barrel to said exterior of said barrel;
such that when said entry shear pin is inserted into said barrel entry pin aperture said entry shear pin passes into said piston entry pin aperture thereby locking said piston in an entry position wherein a fixed distance is maintained between said lower end of said head and said top of said barrel thereby preventing further communication of said venting port with said exterior of said barrel thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel.

[C05] 5. The dump valve of claim 3 wherein said piston ring has a midpoint and an outside and further comprising:

an entry shear pin;

a piston entry shear pin aperture radially formed at said midpoint of said piston ring adapted to receive said entry shear pin and extending from said inside of said piston to said outside of said piston ring; and,

a barrel entry shear pin aperture radially formed near said bottom of said barrel also adapted to receive said entry shear pin and extending from said interior of said barrel to said exterior of said barrel;

such that when said entry shear pin is inserted into said barrel entry pin aperture said entry shear pin passes into said piston entry pin aperture thereby locking said piston in an entry position wherein a fixed distance is maintained between said lower end of said head and said top of said barrel thereby preventing further communication of said dump port with said exterior of said barrel thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel.

[C06] 6. The dump valve of claim 1 further comprising sealing means between said outside of said piston and said interior of said barrel.

[C07] 7. The dump valve of claim 5 further comprising sealing means between said outside of said piston and said interior of said barrel.

[C08] 8. The dump valve of claim 3 further comprising a hold-open spring inserted at said lower of said piston and within said interior of said barrel at the bottom thereof, said hold-open spring being retained whenever the dump valve is attached to a hold-down stinger such that whenever said safety shear pin is sheared said hold-open spring expands upwards thereby holding the dump valve in the dump position.

[C09] 9. The dump valve of claim 5 further comprising a hold-open spring inserted at said lower of said piston and within said interior of said barrel at the bottom thereof, said hold-open spring being retained whenever the dump valve is attached to a hold-down

stinger such that whenever said safety shear pin is sheared said hold-open spring expands upwards thereby holding the dump valve in the dump position.

- [C10] 10. A reciprocating pump dump valve utilized in hydrocarbon service for controlling the flow of produced fluid comprising:
- a hollow piston having an upper end, a lower end, an inside and an outside;
 - a barrel having a top, a bottom, an interior and an exterior and adapted to slidingly receive said piston about said outside thereof;
 - a head having a bottom-side threadingly secured at said bottom-side thereof to said upper end of said piston;
 - a dump port situated approximately midway between said top and said bottom of said piston wherein said dump port provides communication between said inside and said outside of said piston;
 - a piston ring formed about said circumference of said lower end of said piston extending radially away from said piston having a midpoint and an outside;
 - a barrel lip formed within said interior of said barrel approximately midway between said top and said bottom thereof;
 - a safety ring having an interior, an exterior, a top and a bottom adapted to be slidingly received by said piston;
 - a safety shear pin;
 - a safety ring safety shear pin aperture radially formed midway between said top and said bottom of said safety ring adapted to receive said safety shear pin and extending from said exterior of said safety ring to said interior of said safety ring; and,
 - a piston safety shear pin aperture radially formed between said upper end and said lower end of said piston also adapted to receive said safety shear pin and extending from said outside of said piston to said inside of said piston;
 - an entry shear pin;

a piston entry shear pin aperture radially formed at said midpoint of said piston ring adapted to receive said entry shear pin and extending from said inside of said piston to said outside of said piston ring; and,

a barrel entry shear pin aperture radially formed near said bottom of said barrel also adapted to receive said entry shear pin and extending from said interior of said barrel to said exterior of said barrel;

such that when said entry shear pin is inserted into said barrel entry pin aperture said entry shear pin passes into said piston entry pin aperture thereby locking said piston in an entry position wherein a fixed distance is maintained between said lower end of said head and said top of said barrel thereby preventing further communication of said dump port with said exterior of said barrel thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel; and

such that when said safety shear pin is inserted into said safety ring safety shear pin aperture said safety shear pin passes into said piston safety shear pin aperture thereby locking said safety ring to said piston such that when said piston moves upward within said barrel said safety ring contacts said barrel lip thereby preventing full upward movement of said piston preventing further communication of said dump port with said exterior of said barrel thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel; and

such that when said safety shear pin is sheared said safety ring slides along said piston towards said piston ring thereby allowing further upward movement of said piston and allowing further communication between said dump port and said exterior of said barrel placing the dump valve in said dumping position thereby allowing flow of produced fluid from said inside of said piston to said exterior of said barrel; and

such that when said piston is fully upward said safety ring comes to rest between said piston ring and said barrel lip thereby inhibiting further upward movement of said piston and wherein said bottom side of said cylindrical head comes to rest against said top of said barrel when said piston is fully downward thereby inhibiting further downward movement of said piston; and,

wherein said piston is capable of limited upward and limited downward movement within said barrel such that when said piston is fully upward said dump port is in further communication with said exterior of said barrel placing the dump valve in a dumping position thereby allowing flow of produced fluid from said inside of said piston to said exterior of said barrel and such that when said piston is fully downward said dump port is not in communication with said exterior of said barrel placing the dump valve in a closed position thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel.

[C11] 11. The dump valve of claim 10 further comprising sealing means between said outside of said piston and said interior of said barrel.

[C12] 12. The dump valve of claim 10 further comprising a hold-open spring inserted at said lower of said piston and within said interior of said barrel at the bottom thereof, said hold-open spring being retained whenever the dump valve is attached to a hold-down stinger such that whenever said safety shear pin is sheared said hold-open spring expands upwards thereby holding the dump valve in the dump position.

[C13] 13. A reciprocating pump dump valve positioned below the standing valve assembly but above the stinger assembly of a reciprocating pump placed within the production tubing of a well for controlling the flow of produced fluid comprising:
a hollow piston having an upper end, a lower end, an inside and an outside;
a barrel having a top, a bottom, an interior and an exterior and adapted to slidably receive said piston about said outside thereof;
a head having a bottom-side threadingly secured at said bottom-side thereof to said upper end of said piston;
a dump port situated approximately midway between said top and said bottom of said piston wherein said dump port provides communication between said inside and said outside of said piston;

a piston ring formed about said circumference of said lower end of said piston extending radially away from said piston having a midpoint and an outside;

a barrel lip formed within said interior of said barrel approximately midway between said top and said bottom thereof;

a safety ring having an interior, an exterior, a top and a bottom adapted to be slidably received by said piston;

a safety shear pin;

a safety ring safety shear pin aperture radially formed midway between said top and said bottom of said safety ring adapted to receive said safety shear pin and extending from said exterior of said safety ring to said interior of said safety ring; and,

a piston safety shear pin aperture radially formed between said upper end and said lower end of said piston also adapted to receive said safety shear pin and extending from said outside of said piston to said inside of said piston;

an entry shear pin;

a piston entry shear pin aperture radially formed at said midpoint of said piston ring adapted to receive said entry shear pin and extending from said inside of said piston to said outside of said piston ring; and,

a barrel entry shear pin aperture radially formed near said bottom of said barrel also adapted to receive said entry shear pin and extending from said interior of said barrel to said exterior of said barrel;

such that when said entry shear pin is inserted into said barrel entry pin aperture said entry shear pin passes into said piston entry pin aperture thereby locking said piston in an entry position wherein a fixed distance is maintained between said lower end of said head and said top of said barrel thereby preventing further communication of said dump port with said exterior of said barrel thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel; and

such that when said safety shear pin is inserted into said safety ring safety shear pin aperture said safety shear pin passes into said piston safety shear pin aperture thereby locking said safety ring to said piston such that when said piston moves upward within said barrel said safety ring contacts said barrel lip thereby preventing

full upward movement of said piston preventing further communication of said dump port with said exterior of said barrel thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel; and
such that when said safety shear pin is sheared said safety ring slides along said piston towards said piston ring thereby allowing further upward movement of said piston and allowing further communication between said dump port and said exterior of said barrel placing the dump valve in said dumping position thereby allowing flow of produced fluid from said inside of said piston to said exterior of said barrel; and
such that when said piston is fully upward said safety ring comes to rest between said piston ring and said barrel lip thereby inhibiting further upward movement of said piston and wherein said bottom side of said cylindrical head comes to rest against said top of said barrel when said piston is fully downward thereby inhibiting further downward movement of said piston; and,
wherein said piston is capable of limited upward and limited downward movement within said barrel such that when said piston is fully upward said dump port is in further communication with said exterior of said barrel placing the dump valve in a dumping position thereby allowing flow of produced fluid from said inside of said piston to said exterior of said barrel and such that when said piston is fully downward said dump port is not in communication with said exterior of said barrel placing the dump valve in a closed position thereby inhibiting flow of produced fluid from said inside of said piston to said exterior of said barrel.

[C14] 14. The dump valve of claim 13 further comprising sealing means between said outside of said piston and said interior of said barrel.

[C15] 15. The dump valve of claim 13 further comprising a hold-open spring inserted at said lower of said piston and within said interior of said barrel at the bottom thereof, said hold-open spring being retained whenever the dump valve is attached to a hold-down

stinger such that whenever said safety shear pin is sheared said hold-open spring expands upwards thereby holding the dump valve in the dump position.

Item Listing

Offered as an aid to examination – to be included in the application at the discretion of the Examiner

- | | |
|-----|---------------------------------------|
| 1 | Barrel |
| 12 | Barrel Entry Pin Aperture(s) |
| 13 | Barrel Threads |
| 14 | Barrel Lip |
| 2 | Piston |
| 21 | Piston Ring |
| 22 | Piston Entry Pin Aperture(s) |
| 23 | Piston First Upper O-ring Groove |
| 24 | Piston Second Upper O-ring Groove |
| 25 | Piston First Lower Dump O-ring Groove |
| 26 | Piston Safety Shear Pin Aperture |
| 27 | Barrel to Head Threads |
| 3 | Head |
| 31 | Head Threads |
| 32 | Head to Barrel Threads |
| 4 | Safety Ring |
| 41 | Safety Ring Dump Shear Pin Aperture |
| 42 | Optional Safety Ring O-ring Groove |
| 5 | Dump Port(s) or Aperture(s) |
| 6 | Safety Ring Shear Pin |
| 7 | Entry Shear Pin(s) |
| 8 | Piston O-rings |
| 9 | Optional Safety O-ring |
| 10 | The Instant Device in General |
| 99 | Spring |
| 100 | Valve Cage |
| 101 | Pump Ball and Seal Assembly |
| 102 | Pump |
| 103 | Optional Standing Head Valve |
| 104 | Pull Rod |
| 105 | Sucker Rod string |